

Remarks

This paper is in response to the Office Action dated January 30, 2007. Claim 1 and Claim 9 are currently amended to remove the recitation of *for a time period*, which is not needed for patentability. Claim 9 is currently amended to recite that the furnace includes selective catalytic reduction and an electrostatic precipitator. Further, Claim 9 and Claim 17 are currently amended to recite that the desirable SO₃ level is desirable for optimizing electrostatic precipitator function. Claims 1-8; 9-16; and 17-24 remain in the case with none of the claims being allowed. Applicant respectfully requests favorable reconsideration based on the remarks below.

35 U.S.C. § 112

The Office maintains its position that applicant's specification does not enable one of ordinary skill in the art to practice the present invention. Regarding Claim 1, the Office does not believe the specification enables one of ordinary skill in the art to *adjust the reducing environment time period such that SO₃ is reduced to SO₂ prior to selective catalytic reduction to achieve a desirable level of SO₃*. Regarding Claim 9, the Office does not believe the specification enables one of ordinary skill in the art to *adjust the reducing environment time period such that SO₃ is reduced to SO₂ to achieve a desirable level of SO₃*. Regarding Claim 17, the Office does not believe the specification enables one of ordinary skill in the art to *adjust the reducing environment time period such that SO₃ is preferentially reduced to SO₂ to achieve a desirable level of SO₃*.

Applicant's specification enables numerous ways to adjust the reducing environment. As provided in applicant's specification, to increase the reducing environment, the residence time can be increased or the reducing potential in the flue gases can be increased (see, for example, page 9, lines 3-4). Several methods of increasing the residence time and several examples of increasing the reducing potential are provided (page 9, lines 5-17):

To increase residence time, several methods are available.

- 1) The distance between stages can be lengthened
- 2) The mixing can be increased for macro-staging applications
- 3) The mixing can be decreased for micro-staging applications
- 4) The mass flow between stages can be reduced (deeper staging)
- 5) The volumetric utilization between stages can be increased (e.g., swirl)
- 6) The pressure can be increased

- 7) The density can be increased

To increase the reducing potential in the flue gases, several methods are available.

- 1) The temperature can be increased
- 2) The stoichiometric ratio (i.e., the air-to-fuel ratio) can be decreased
- 3) The local fuel flow can be increased (for fixed air flow)
- 4) The local air flow can be decreased (for fixed fuel flow)

The Examiner has indicated that he does not believe that these parameters enable because the “specification has few details as to what values these parameters should be in order to enable the invention”. Applicant respectfully disagrees.

Applicant’s parameters are clearly disclosed in relative terms in the specification. The values of these parameters are recognizable and roughly quantifiable relative to operating conditions at a given plant. Applicant respectfully believes the Examiner is familiar with combustion technology and coal-burning power plants, which are the primary application for the present invention, and is also familiar with the fact that virtually all power plants are different, e.g., of a different size, of a different construction, utilizing a different type of coal, etc. Because of the structural and operational differences between plants, normal operational parameters at any given plant are empirical and dynamic. As such, at any given power plant (where standard operation conditions are already determined and in place), the actual values for the disclosed parameters will be recognizable and roughly quantifiable to one of ordinary skill in the art relative to the operating conditions of that particular power plant without undue experimentation. For these reasons, Applicant respectfully submits that the *adjusting* limitation of the present invention is enabled.

A *desirable level of SO₃ for optimizing precipitator function* is also enabled by the specification as filed. As set forth in the specification as filed, a desirable level of SO₃ for current precipitators is between about 10 and 15 ppm (page 11, lines 4-6). Further, as set forth in the specification, the dewpoint temperature is a convenient parameter for estimating and/or adjusting the reducing environment variables in order to achieve adequate reduction of acidity and/or desired SO₃ levels. For a desired level of SO₃ and operating relative humidity, the dewpoint can be determined and the reducing environment variable adjusted

accordingly to achieve the desired dewpoint. (page 11, lines 7-11) The relationship between dewpoint and SO₃ concentration is explained on page 1, lines 16-17 of the application as filed.

In addition, Applicant's specification provides several examples, in Tables 1 and 2, of the significant SO₃ reduction realized by increasing residence time using reduced mass flow between stages (deep staging). These tables clearly explain the values used to adjust. For the "shallow" staging cases, the over-fired air ports were nearly closed, but still contained cooling flow (around 10% of the total air). For the "mid" staging case, the over-fired air ports made up nearly 20% of the total air flow. For the "deep" staging cases, the over-fired air ports made up nearly 30% of the total air flow. All three units were corner-fired units and the OFA system was located well above the burner zone.

The existence of working examples strongly supports enablement. *In re Wands*, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). The reduction of SO₃ achievable by using the present invention is significant, as illustrated by applicant's examples, and "strongly supports enablement".

It also is well settled that a patent applicant need not set forth all information necessary to practice the claimed invention. See, for example, MPEP §2164.05(a). Courts hold that information well known to persons of ordinary skill in the art need not be included in the specification and is preferably omitted. *In re Buchner*, 929 F.2d 660, 18 USPQ2d 1331 (Fed. Cir. 1991). Thus, reconsideration and allowance is respectfully requested.

35 U.S.C. §102(b)

The Office rejects Claims 9-16 under 35 U.S.C. §102(b) as being anticipated by United States Patent No. 4,824,441 ("Kindig"). The Office states:

Kindig shows...b) adjusting the reducing environment for a sufficient time period such that SO₃ is reduced to SO₂ to achieve a desirable level of SO₃; (col. 13, lines 8-23, SO₃ and SO₂ are inherently produced during combustion, and reduction is inherently occurring)....

Applicant respectfully disagrees and requests reconsideration. Kindig teaches maintaining an oxidizing environment. Specifically, Kindig teaches that “[the] formation of sulfur trioxide [from sulfur dioxide] according to the following reaction is favored....” (col. 13, lines 11-12). That is, Kindig teaches an environment where sulfur dioxide is inherently oxidized to sulfur trioxide. Further, Kindig teaches to increase oxidation through the use of a catalyst and provides examples of several electron acceptors that could be used to drive the oxidation. (col. 13, lines 23-30). A reducing environment is something completely different. As set forth in applicant’s specification (page 12, lines 6-11):

A reducing environment is one where the ratio of the concentrations of reducing radicals to oxidizing radicals is greater than about 1; more specifically, the ratio of the concentrations of H radicals to O radicals is greater than about 1. A better reducing environment is one where the ratio of the concentrations of reducing radicals to oxidizing radicals is greater than about 10; more specifically, the ratio of the concentrations of H radicals to O radicals is greater than about 10.

Thus, Kindig discloses doing the exact opposite of what Applicant is doing in his attempt to achieve a superficially similar goal. Therefore, it is respectfully submitted that Kindig does not teach, either expressly or inherently, Applicant’s reducing environment such that SO₃ is reduced to SO₂ to achieve a desirable level of SO₃. For at least this reason, Applicant respectfully believes that Kindig does not anticipate or render obvious the currently claimed invention.

35 U.S.C. §103

Claims 1-3, 8, 9-11, 16 17-19, and 24 are currently rejected under 35 U.S.C. §103 as being unpatentable over United States Patent No. 4,381,718 (“Carver”) in view of United States Publication No. 2004/0120872 (“Fan”). Applicant respectfully disagrees.

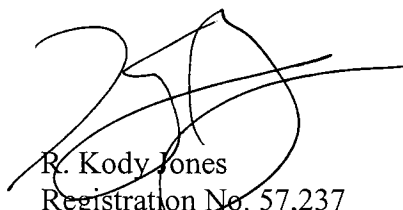
Carver does disclose methods to reduce SO_x generally and Fan does disclose using SCR to reduce NO_x. However, neither Carver nor Fan are concerned with precipitator function generally, nor are they concerned with *adjusting* SO₃ levels to *optimize precipitator function*. For at least this reason, a combination of Carver and Fan

does not render Applicant's invention obvious. Kindig is similarly unable to fill in the voids. Thus, reconsideration and allowance is respectfully requested.

Conclusion

Applicant submits that all claims are allowable for the reasons given above and that the case is in condition for allowance. Such action is respectfully requested. However, if any issue remains unresolved, a telephone interview to expedite allowance and issue would be welcomed.

Respectfully submitted,



R. Kody Jones
Registration No. 57,237
MacCord Mason PLLC
(336) 273-4422

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